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WHERE TO PLACE PRODUCT REVIEWS? AN INFORMATION SEARCH PROCESS PERSPECTIVE

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WHERE TO PLACE PRODUCT REVIEWS? AN INFORMATION SEARCH PROCESS PERSPECTIVE

Completed Research Paper

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Abstract

Online product reviews could be presented as expert reviews and user reviews. However, a fundamental question that is not fully understood, and which this study addresses, is: Where should product reviews be displayed so as to positively affect a consumer's decision-making performance? We focus on evaluating the impact of the placements and the source of reviews (i.e., the pre-screening or post-screening display of experts' or users' comments) on consumer behavior. Building on the underpinnings of Kuhlthau's model of information search process, we propose that the Expert-User product review provision (i.e., placing the expert reviews before the screening stage and the user reviews after the screening stage) will lead to higher purchase decision performance than the User-Expert product review provision. We subsequently designed an experiment to validate the proposition. The results reveal that the Expert-User product review provision would lead to a higher purchase decision performance than the User-Expert product review provision, in terms of both the decision process and decision outcome.

Keywords: Product Review, Information Placement, Information Search, Reason-Based Choice

Introduction

Providing online product reviews is gaining growing importance on the Internet online marketplace. To remain competitive, online shopping websites are compelled to post product reviews for consumers. Product reviews are generally manifested in the form of expert reviews and user reviews. An expert review refers to the description and assessment of a product by some experts (e.g. CNet.com for expert reviews). On the other hand, user reviews denote the description, use, experience and personal opinions of the product by some users (e.g. online Word-of-Mouth). An implicit assumption underlying the provision of the product review is that consumers are enabled to make better and more informed decisions, leading to the derivation of higher procurement satisfaction. However, the question of how to offer product reviews is not fully appreciated in the extant literature. There are two primary reasons contributing to this shortfall in extant research. First, the bulk of extant studies has focused on comparing the effects of positive and negative product reviews on the purchase decision (Bansal et al. 2000; Duan et al. 2008b; East et al. 2008; Hu et al. 2008), the number of product reviews and information overload (Park et al. 2008b), the relationship between the valence of a product review, the consumer's attitude toward the product and the purchase decision (Duan et al. 2008a). These studies predominantly focused on assessing the impact of a singular review form (e.g., expert or user reviews, but not both) and the features (e.g., the number of positive and negative reviews) on consumer behavior. Our review of the extant website implementations (e.g., detail.zol.com.cn, reviews.cnet.com integrated with mysimon.com) suggest that there is an increasing number of commercial websites providing both forms of product reviews.

Second, different product reviews are made available to consumers during different stages of the decision-making process, i.e., the pre-screening and post-screening stages, in several shopping websites (e.g., dooyoo.com.uk and newegg.com). To this end, studies that assessed the placement of the product reviews yield mixed findings. Some scholars have found that information used in the pre-screening stage appears less important than information acquired after the screening stage (Biehal et al. 1982; Kleinmuntz et al. 1993; Chakravarti et al. 2006), while others argue that the impact of a product review is strongly related to the pre-screening product review provision and its impact on a consumer's propensity towards buying (East et al. 2008). Notwithstanding these mixed results, we could infer that shopping websites should be designed more proficiently by accommodating a range of consumers' informational needs at different stages of the decision-making process (Bettman et al. 1977; Einhorn et al. 1987).

In response to these two concerns, this study seeks to comprehend the relationship between the placements of the reviews, the source of the reviews (i.e., pre-screening or post-screening display of experts' or users' comments) and purchase decision performance. Anchoring on Kuhlthau's model information search process (ISP) (Kuhlthau 1991; Kuhlthau et al. 2008), we conceive that the Expert-User product review provision (i.e., placing expert reviews before the screening stage and user reviews after the screening stage) would lead to a higher purchase decision performance than the User-Expert product review provision (i.e., having user reviews placed before the screening stage and expert reviews placed after the screening stage). Indeed, given that Kuhlthau's ISP model depicts consumers' cognitive behavior in the entire information search process, it is quite apt to explain the consumer's procurement decision behavior and the impact of product reviews on the online shopping process, as it has been rarely researched in the IS discipline. It is to be noted that as mentioned previously, most prior research has examined the impact of the number of reviews and the valence of a review on purchase decision performance (Liu 2006; Park et al. 2007; Doh et al. 2009). Hence, we shall focus on the source of a review and its placement over the number of reviews and the valence of a review. In this manner, this study serves to complement the existing studies on product reviews.

This study extends the prior research in three ways. First, we contribute to the work on the consequences of the product reviews in terms of the relationship between the combined placements of the expert and user reviews and the consumers' behavior. Second, we design the research context to investigate consumer decision-making throughout the entire process of an online procurement. To this end, we built an experiment system that emulates an actual shopping website using real product details and catalogs. Third, we highlight the joint impact of the sources of reviews and placement of reviews, which is commonly apparent in the commercial shopping websites.

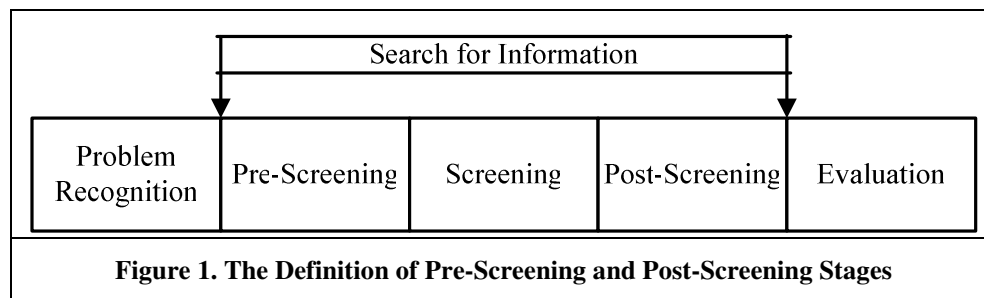
The paper is organized as follows. First, we introduce the theoretical lens of Kuhlthau's ISP model in the context of product review provision. Next, we develop a set of hypotheses to illustrate how we expect the provision of reviews to impact the consumer purchase decision. This is followed by a description of the methods used to test these hypotheses. We then report the results of our empirical study. The paper concludes with a discussion on the findings. In addition, some theoretical and managerial suggestions will be presented.

Theoretical Underpinnings

Consumer Online Purchasing Process

The consumer's online purchasing process can be regarded as a decision process. That is, the consumer first visits the B2C websites, and then selects the product before making a procurement decision. The general thrust of the consumer's online purchasing process is that the consumer's progresses first from a state of felt deprivation (Problem Recognition) to the Search for Information on possible solutions. Employing the information gathered as the basis for the Evaluation of Alternatives, the consumer next makes the Choice and Purchase. Finally, the consumer will experience the Post-Purchase Behavior, which is manifested as the perception of satisfaction/dissatisfaction with the product (Butler et al. 1998).

In the Search for Information stage of the consumer's online purchasing process, the consumer gathers information from external sources (e.g., product review, sales promotions). With an excessive plethora of product information available in the B2C website, the consumer tends to use decision aids to facilitate the information search process. When using decision aids for facilitating the product information search, the consumer would initiate the decision-making process by establishing a list of minimally acceptable product attribute levels that the alternatives must possess in order to be considered further as possible choices. This process of delineating such attribute levels and filtering alternatives that fail to meet the criteria is known as screening (Tan et al. 2010). The stage before the screening stage and after the screening stage corresponds to the pre-screening stage and post-screening stage respectively in the consumer's online purchasing process. More specifically, the pre-screening stage is between the consumer's problem recognition stage and screening stage. The post-screening stage is in between the consumer's screening stage and evaluation of alternatives stage (Figure 1).



Online Product Review Provision

Prior research has suggested a positive relationship between the provision of reviews and procurement decision-making performance (Liu 2006; Duan et al. 2008a). Table 1 summarized and compared some prior studies and this study. The general premise (*if placed appropriately*), is that the product reviews might increase the salience of a product in the minds of consumers, which could either facilitate the formation of the preference criteria at the screening stage and/or deriving procurement decisions after product alternatives are screened (Forman et al. 2008). To this end, we adopt the theoretical lens of Kuhlthau's ISP model to explicate the different information search behaviors during the decision-making process.

Table 1. The Comparison of This Study and Prior Researches

Research on the product review and online shopping			
	Source of information	Placement of information	Scope of research
Dale F. Duhan et al. (1997)	Multi-sources, from family, friends and strangers	Single-placement, consumer access to product review after screening	This study analyzed <u>recommendations</u> from different sources and their usage in the consumer procurement decision-making process.
Shahana Sen, Dawn Lerman	<u>Single-source</u> , from	<u>Single-placement</u> ,	This study only investigated the

(2007)	consumers	consumers access to product review after screening	<u>different valences of WOM as the recommendation source</u> and their impact on consumer decision-making.
Yubo Chen, Jinhong Xie (2008)	<u>Multi-sources</u> , both from sellers and buyers	<u>Single-placement</u> , consumers given access to product review after screening	This study <u>differentiated between two sources of recommendation information (seller-created product information and buyer-created review information)</u> and their impact on consumer online procurement activities.
Research on the consumer's information assessment and decision-making			
Amitav Chakravarti, Chris Janiszewski and Gulden Ulkumen (2006)	<u>Single-source</u> , from the sellers	<u>Multi-placement</u> , pre-screening and post-screening	This study investigated the <u>different impacts of recommendation information placed in different stages</u> of the purchase decision-making process.
Wendy Liu (2008)	N/A	<u>Single-placement</u> , to place or not to place supplement information during the decision-making process	This study focused on the presence of supplement information supporting the decision-making. <u>Different types of information presented influence the decision performance.</u>
This research			
	<u>Multi-sources</u> , Both the user and expert reviews	<u>Multi-placement</u> , pre-screening and post-screening	This study investigated the <u>joint impacts of different sources of product reviews with different placements</u> on the consumer purchase decision performance.

Kuhlthau's model of Information Search Process (ISP) is one of the central theories in research on information search. The central thrust of the model is that a user will cognitively require different types of information at different stages of decision-making. More elaborately, the model posits that information search tasks differ across stages of information retrieval for decision-making (Kuhlthau 1991). Three information search tasks advocated in Kuhlthau's ISP model, in sequential order, are the seeking of background information, the seeking of relevant information and the seeking of focused information. The seeking of background information task refers to the effort in acquiring a product's background information so as to facilitate an individual to know and identify the products to be considered. Applied to the consumer online shopping context, it corresponds to the demands for seeking pre-screening information. The seeking of relevant information task thus consequentially refers to the elicitation of the product preferences. This is followed by another information search task to assist a consumer in making (perhaps in certain compromised situations) procurement decisions. The last informational need corresponds to the information search task for focused information, which occurs in the post-screening stage and thus is crucial for the consumer's evaluation and choice of alternatives.

Results from the research on the importance of providing pre-screening product information are mixed. Some studies posit that information used in the pre-screening process is less important than information acquired later in the search process. This is because screening encourages decision-makers to shift their emphasis from pre-screening information to post-screening information (Kleinmuntz et al. 1993). Other scholars observed that the impact of a product review on a consumer's propensity towards buying could be exemplified by the provision of pre-screening product reviews (East et al. 2008).

Furthermore, there are mixed findings on providing different sources of product reviews in the post-screening stage. Researchers have investigated the relationship between the user review and the purchase decision (Chatterjee 2001). Jiang and Wang (2008) discussed the economic impact of product reviews depending on their informativeness, the number of product attributes and a competitive market (Jiang et al. 2008). Other scholars argue that when consumers are evaluating the alternatives, the user review, as well as the quality and quantity of reviews, is positively related to the sales performance (Chen et al. 2004). On the other hand, other researchers have discovered that consumers

sometimes prefer expert reviews to user reviews in the online shopping process. This is because expert reviews could provide definite and professional comments thus reducing consumers' search costs, and hence resulting in the saving of effort and time (Bakos 1997). Notwithstanding the mixed findings, all these studies generally lack a focus on a single form of product review and display a poor understanding of the informational needs of the product review at different stages of decision-making. The ISP model compensates for this limitation by predicting that some product background information should be provided at the pre-screening stage in order to elicit the information uncertainty faced by consumers, and the consumers' cognitive informational needs are altered from stage to stage. In our context, the consumer would use the product information acquired prior to screening to build the initial preference criteria for filtering the product alternatives. Based on the results of the screening attempts, a consumer would evaluate the presented product alternatives in depth, find the reason for his/her choice and make a purchase decision (Kuhlthau 1991; Kuhlthau et al. 2008).

Research Model and Hypotheses Development

Our overarching proposal is that a consumer's perception and procurement decision could be jointly influenced by the source and placement of the product reviews. Figure 2 depicts the research model. Building on the model of Kuhlthau's ISP, we posit:

Thesis: *The Expert-User product review provision will have a more positive and more significant impact on the decision process and outcome than the User-Expert product review provision.*

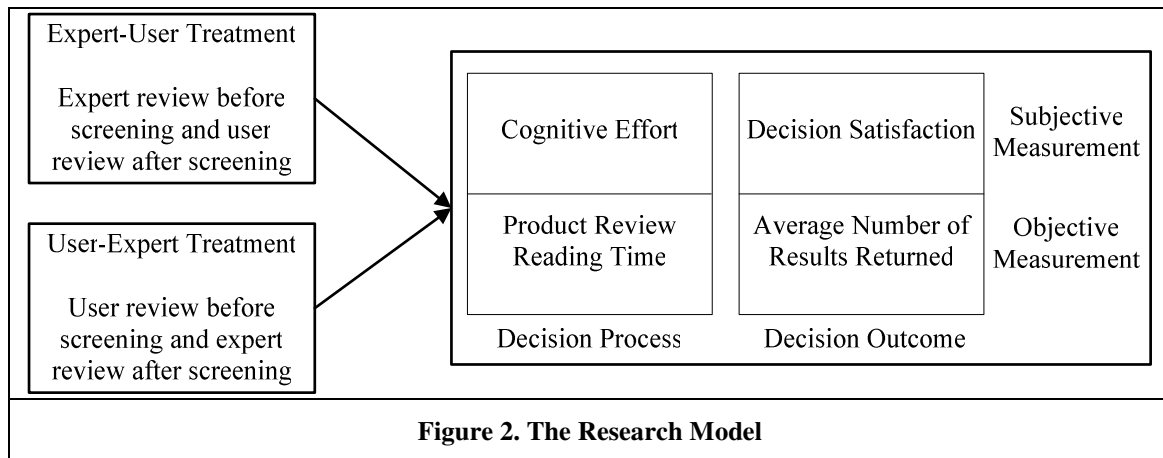
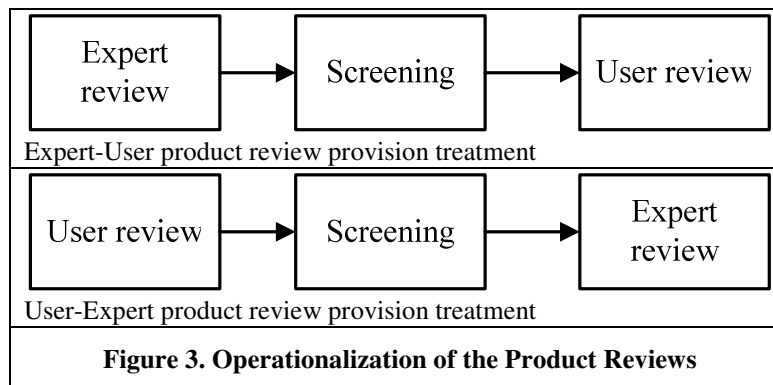


Figure 2. The Research Model

This study analyses the expert and user reviews. We conceive that both user and expert reviews are different (Table 2). The expert review refers to the product review written by expert reviewers who are often hired by popular e-commerce vendors or hosting portals. However, the user review refers to the evaluations posted by users or consumers based on their personal experiences and viewpoints. It was observed by prior studies (e.g., Ambler et al. 2007) that the expert reviews are often in-depth and unbiased toward the evaluation of a product. Furthermore, expert reviews are typically product-oriented, and contain extensive product information. In fact, the content of expert is highly relevant toward the product (Chen et al. 2008). To this end, the primary objective of expert reviews is to ensure that consumers are well informed about the product's content and characteristics (Sorensen et al. 2004). Reinstein and Snyder (2005) found that when consumers are uncertain about the product they are going to procure; expert product reviews can facilitate their purchase decision and make their choice easier (Reinstein et al. 2005).

Compared with the expert reviews, the user reviews include consumers' experiences, evaluations, and opinions. Park et al. (2007) argued that online user reviews provide user experience-oriented product information. Hence, consumers would perceive that the user reviews represent the previous consumers' usage experience and thus are more understandable than the expert reviews. Park also found that user reviews are not presented in a standard form and the comments in these reviews can be either subjective or objective. It is to be further noted that prior researches have also shown that user reviews tend to reflect extremely positive or negative biases (Herr et al. 1991). Hence, the user reviews are the natural expressions of the consumers' usage experiences and opinions. They do not reflect definite comments. Figure 3 depicts the operationalization of the product reviews provision.

Table 2. The Comparison of Expert and User Reviews		
	Expert review	User review
Orientation	Product-oriented	Experience-oriented
Format	Well formatted	Not well formatted
Usage experience-driven	No	Yes
Relevance	High relevance	Low relevance
Sufficiency	Sufficient (on average)	Insufficient (on average)
Objectivity	Objective	Subjective
Comment	Definite	Disjunctive



Based on taxonomy proposed by Lilien, we assess the decision performance of consumers by two criteria – the decision process and the decision outcome (Lilien et al. 2004). The decision process, which involves the reading of product reviews, as well as the screening and evaluation of product information to yield a purchase choice, is characterized by product review reading time and cognitive effort. The product review reading time denotes the actual time cost for the reading of both the pre-screening product review and post-screening product review. It is an objective measurement. The cognitive effort refers to the consumer's perception of effort to be spent during the shopping process before buying a new product (Cooper-Martin 1994).

The decision outcome constitutes two variables: decision satisfaction and the average number of results returned. Decision satisfaction is a subjective indication of how a decision-maker perceives his/her decisions to be satisfactory. The average number of results returned is the number of alternatives returned when participants are screening on the experiment system. The smaller the average number of results returned, the more effectively the product review provision combination helps consumers in enhancing the decision performance.

Impact on the decision process: From the perspective of the ISP model, consumers have the conscious need for information to construct a mental representation of the product to be procured. Such need for information, prior to the construction of the preference criteria for screening, could be facilitated by product reviews (Kuhlthau 1991). Specifically, comparing the two forms of product reviews, the expert review often contains more assertive product information. It is well formatted, and the information therein is extensive. By comparison, the user review typically contains a sizable set of individual consumer reviews with different and “experiential” assessments. Such forms of provision at the initial stage of the decision-making process could induce confusion and information overload (Park et al. 2008a). According to the Kuhlthau ISP model, the first task of the consumer online purchasing process is to seek background information to generate the cognition of the nature of the general product information in the marketplace (e.g., What is the new model of this range of laptops? Which laptop is a high performance model? What is the average performance of the main-stream chipset in laptops?). The seeking of background information task refers to “acquiring the background information of a product in order to know and identify the products that are to be pursued”. Applied to the consumer online shopping context, it corresponds to the need to seek pre-screening information. The Expert-User product review provision could provide sufficient and definite product information to

consumers. In this regard, a consumer may not devote time to process the information experienced when overloading occurs right at the beginning. Hence, by comparison, the consumer ought to be able to find a higher degree of relevance to the mental comprehension of the product with the Expert-User product review provision. Thus, they would devote more effort (i.e., time) to understanding the product. Hence, we posit:

H1: *Prior to the screening of product alternatives, the presence of the Expert-User product review provision will lead to a greater amount of time spent on reading the product reviews than in the presence of the User-Expert product review provision.*

The seeking of relevant information task thus consequentially refers to the elicitation of the product preferences. This is followed by another information search task to assist a consumer in making (perhaps in certain compromised situations) procurement decisions. The last informational need corresponds to the information search task for focused information, which occurs in the post-screening stage and thus is crucial for a consumer's evaluation and choice of alternatives. At the post-screening stage, a consumer will develop another form of informational need so as to facilitate the evaluation of and comparison among presented product alternatives (Kuhlthau 1991). According to the Kuhlthau ISP model, a consumer would like to seek the focused information at this stage. In the case of the Expert-User product review provision, the information provided by the user reviews after the screening stage could reinforce and assist in the making of an informed decision by a consumer. This is because consumers often rely on the user review (e.g. user Word-of-Mouth) when selecting a new product or service (Riegner 2007). The user review could provide the personal usage experience and the factual performance of the products, positively or negatively. For consumers, this information could facilitate in the assessment of the available alternatives and draw their attention to the focused products (Chevalier et al. 2006). It could help consumers in reducing the cognitive effort of choosing one product from hundreds of alternative sets (Shafir et al. 1993). Likewise, with the product information acquired at the pre-screening stage, a consumer would have a mental illustration of the product and hence would proceed to the pre-screening decision-making judgment (Punj 1987). Subsequently, the consumer is less inclined to devote a significant amount of effort in processing other product information sources (Kahn et al. 1995). Consequently, it is expected that less time would be spent in processing the product reviews at the post-screening stage. . Thus we posit:

H2: *During the online shopping decision process, the presence of the Expert-User product review provision would lead to lower cognitive effort than with the User-Expert product review provision.*

H3: *After the screening of product alternatives, the presence of the Expert-User product review provision would lead to the spending of less time on reading product reviews than with the User-Expert product review provision.*

Impacts on decision outcome: Previously we hypothesized in H1 that a consumer presented with expert reviews prior to defining the screening criteria would devote significantly more time to comprehend the product. Through the lens of the Kuhlthau ISP model, a consumer would feel more comfortable if the constructive information about the product is acquired in the pre-screening stage. With the facilitation of the prior product information and the provision of suitable information, a consumer would experience greater ease in developing a more concise set of product criteria, resulting in fewer product alternatives (Hong et al. 2004). In other words, with regard to the Expert-User product review provision, the expert review provided at the pre-screening stage could help the consumer to filter off the non-suitable alternatives, and yield a small consideration set. Hence, we posit:

H4: *The presence of the Expert-User product review provision would lead to a smaller average number of results returned than with the User-Expert product review provision.*

At the post-screening stage, the consumer should make an explicit choice selection. At this stage, information is needed to justify the consumer's choice. From the perspective of the Kuhlthau ISP model, consumers have the compromised need for the focused product information to harmonize between how they originally envision the product and the product's factual performance and usage experience (Kuhlthau 1991). When an online consumer starts to make a choice, his focus of the shopping process shifts from the choice of a good product to that of perceiving good reasons (Butler et al. 1998). In dealing with this difficulty, some scholars have suggested that consumers are more inclined towards the user reviews when they make their procurement decision (Chatterjee 2001; Park et al. 2007). The Expert-User product review provision could provide the user review at the post-screening stage. By reading the user reviews, consumers would be able to distinguish between the factual pros (advantages) and cons (drawbacks) of the product. Compared with the User-Expert product review provision, the Expert-User product review provision can provide potential consumers with the experience of using the product. Furthermore,

the Expert-User product review provision focuses on the experiences of other consumers, hence providing the feedback to predict the user experience if consumers decide to buy the product. Thus, this information could enhance satisfaction with the choice. Hence, we posit:

H5: *The presence of the Expert-User product review provision would lead to higher decision satisfaction than the User-Expert product review provision.*

Research Methodology

Experiment Design

We employed a laboratory experiment design to test the hypotheses. The two different treatment groups were the Expert-User product review provision formation and the User-Expert product review provision formation. Taking a similar approach to Kumar and Benbasat (2006), we study the commercial implementations and extract the product content of commercial websites to manipulate the decision aids offered for product review provision (Kumar et al. 2006). Actual commercial websites were referred to for product review content. In this experiment, we manipulated the product review placement and the source of the reviews. For the Expert-User product review provision treatment group, we placed the expert review before the screening stage and the user review after the screening stage. Conversely, for the User-Expert product review provision treatment group, we placed the user review before the screening stage and the expert review after the screening stage. In order to minimize the disturbance of image-based cues from the product reviews, all the user and expert reviews were text-based.

We measured the dependent variables by using both objective and subjective measurements. With the decision process, we measured the perceived cognitive effort as the subjective data, and the product review reading time (both the pre-screening review and post-screening review reading times) as the objective data. Similarly, we measured the perceived decision satisfaction as the subjective data and the average number of results returned after screening as the objective data. This data enables us to reflect the decision outcome. Finally, the measurement of both the decision process and decision outcome would reflect the overall decision performance (Lilien et al. 2004). Table 3 summarizes the dependent variables.

Table 3. Operationlization of Dependent Variables		
Decision Process		Operational Methods
<i>Subjective measures</i>	Cognitive effort	Use of a questionnaire
<i>Objective measures</i>	Reading time (pre, post)	System records the reading time
Decision Outcome		
<i>Subjective measures</i>	Decision satisfaction	Use of a questionnaire
<i>Objective measures</i>	Ave . number of results returned	System records the number of returned results

Experiment Procedures

A total of 144 observation data (24 participants \times 2 treatments \times 3 product categories) were collected. We recruited 48 participants from a public university in the Asia-Pacific region and randomly assigned them to two treatment groups. In order to yield an effect size f of 0.25, and power of 0.95 for six measurements, the total sample size required was 28. The collected total sample size of 48 far exceeds that of the required sample size threshold. Among the participants, 17(35.4%) were females and 31(64.6%) were males. All the participants, with ages averaging between 21 and 23 years, were recruited online. The instructions of the experiment guided the participants to procure in three product categories. In order to ensure experimental realism, the participants were given monetary incentives at \$5 per hour.

The experiment was conducted in the following sequence. When participants arrived at the laboratory, they were assigned to one terminal randomly and logged in using a designated account (which differentiated the treatment groups). Subsequently, the participants watched a pre-recorded instruction video and viewed the introduction of the

experiment's system. This video, while presenting the features of the experimental system to participants, also demonstrated the viewing process of the product reviews and the shopping experience in the experiment system.

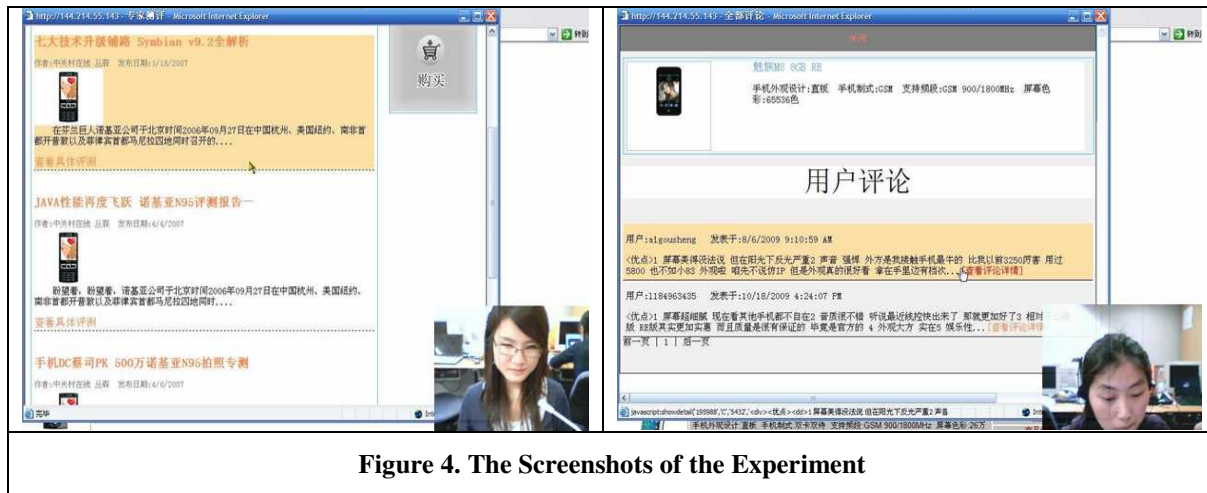


Figure 4. The Screenshots of the Experiment

Participants were presented with a scenario in which they purchased products for themselves. The three product categories included in the experiment system were an mp3 player, a digital camera and a cell-phone. Participants were asked to purchase one product from each product category, and the sequence of purchasing was randomly assigned. This set of products was selected as they frequently appeared in shopping websites. Furthermore, we asked 10 students to rank their level of product knowledge and their willingness to purchase over 20 product categories in the pre-test. We selected the top 3 product categories which participants indicated the greatest willingness to purchase and those for which they had modest prior product knowledge (students were neither familiar nor unfamiliar with the product) for our experiment. To further ensure that the products were neither familiar nor unfamiliar to the participants, they were asked to rate their level of product knowledge on a 7-point Likert scale. The results confirmed that the participants were neither familiar nor unfamiliar with the product categories (mean=4.22, $\delta=1.48$). This setup was consistent with most experimental studies on information seeking and decision-making behavior (Haubl et al. 2000).

In the experiment, we manipulated all other control variables in the two treatment groups. The only difference between the treatment groups was the placement of the product reviews (Expert-User product review provision and User-Expert product review provision). We used a screening strategy based on the weighted-additive (WADD) decision strategy, as this strategy does encourage participants to be more involved in the experiment by scanning the list of reviews and selecting the favorite product. Because individual subjects defined the search criteria differently, each of them received a different number of products after the screening stage. Hence, we only reported only the average number of products left after the screening stage. For the Expert-User product review provision treatment group, there were 98 products left (the average number of products in the alternatives set is 277; 65% of the alternatives were filtered out). Regarding the User-Expert product review provision treatment group, 168 products were left (after 39% of the alternatives had been filtered out). For the product review of each product, on average, each product has 2 expert reviews and 10 user reviews. When the participants had decided to purchase a product, they were asked to complete a questionnaire. There were no time constraints for the experiment.

Linear Random-Intercept with Covariates Regression Modeling

To develop the corresponding statistical analysis model for the collected field dataset presents a challenge for there are many experimental participant-induced variances and factors inherited in the individual rooted preferences and styles where obtaining/computing all of them (or even some of the key factors) could be almost impossible. For instance, it might be impossible to determine the extent of an individual's inherent experience and liking entailed for each of the three product categories displayed, namely, the mp3 player, cell-phone, and digital camera as well as the individual's mental state and search behavior during the commencement of the experiment.

While we have endeavored to provide clear instructions and a conducive environment for the experiments, uncontrollable factors relating to individual and temporal issues could present challenges in performing convincing statistical analysis and deductions based on traditional ordinal least-square regression. Prior studies have attempted to address them partially by asking experiment participants to answer a lengthy set of personality and psychological questions, which could potentially create undesirable cognitive and emotional disturbances for the participants even before the actual commencement of the experiment. To mitigate these limitations, we adopted a hybrid approach by asking the participants with regards to their product knowledge to control for variance due to the different product categories presented; and consequently constructed the linear random-intercept with the covariates regression model with reference to Rabe-Hesketh and Skrondal (2008) to control for the across-participant variances (Rabe-Hesketh et al. 2008). In the next section we will develop, by way of illustration, the regression model for perceived decision satisfaction as the dependent variable. The other regression models involving other dependent variables could be easily derived based on the formulation described.

We started modeling the perceived satisfaction Y_{ij} of an experiment participant j on product i by modifying the standard regression model with covariates and having two error terms, namely 1) the residual ξ_j denoting the experiment participant-specific error component and 2) the \mathcal{E}_{ij} representing the product-specific error component varying among product i as well as participant j . The ξ_j are independent of participants, which could mean random terms depicting the unobserved heterogeneity of the participants, which could be the characteristics of the participants (e.g., the personality and psychological state). The \mathcal{E}_{ij} are independent over participants and products. The two error components are independent of each other as well as of the covariates (i.e., α_{ij}).

$$y_{ij} = \beta_0 + \beta_1 \alpha_{reviewOrderij} + \beta_2 \alpha_{productKnowledgeij} + \xi_j + \mathcal{E}_{ij} \quad (1)$$

To comply with the exogeneity assumption of α_{ij} , we set $E(\xi_j | \alpha_{ij}) = 0$ and $E(\mathcal{E}_{ij} | \alpha_{ij}, \xi_j) = 0$, thus formulating the population average linear regression (Equation 3) and individual-specific (i.e., cluster-specific) linear regression, as depicted below:

$$E(y_{ij} | \alpha_{ij}) = \beta_0 + \beta_1 \alpha_{reviewOrderij} + \beta_2 \alpha_{productKnowledgeij} \quad (2)$$

$$E(y_{ij} | \alpha_{ij}, \xi_j) = \beta_0 + \beta_1 \alpha_{reviewOrderij} + \beta_2 \alpha_{productKnowledgeij} + \xi_j \quad (3)$$

With these specifications, we next perform the hypothesis testing.

Data Analysis

Participants' demographic and personal data such as age, gender, computer experience and online shopping experience were randomized in order to minimize the contingent effect. Further checks indicated that there was no significant difference for participants in all two treatment groups in terms of age ($F=3.14$, $p>.05$) and online shopping experience ($F=.13$, $p>.10$). There was no significant difference across the treatment groups in terms of gender ratio, with the Kruskal-Wallis test ($\chi^2=.47$, $p>.10$).

Manipulation Check

The manipulation check was conducted to ensure our manipulation of the product review provision sequence was successful. The product review provision sequence was assessed by asking participants to rate on a 4-point nominal scale what kind of product review provision sequence they had just seen. A t-test for independent groups was conducted to test the difference between the two treatment groups. The results indicate that there is a significant difference between the Expert-User product review provision treatment group and the User-Expert product review provision treatment group ($t=5.85$, $p<.01$). Participants in each treatment group reported that they experienced the designated treatment ($Mean_{Expert-User}=2.87$, $Mean_{User-Expert}=3.72$). The experiment manipulation was thus deemed successful.

Hypotheses Testing

In this study, we hypothesize that prior to the screening of product alternatives, the presence of the Expert-User product review provision will lead to a greater amount of time spent on reading the product reviews than in the presence of the User-Expert product review provision. Moreover, the Expert-User product review provision will also lead to lower cognitive effort, less product review reading time at the post-screening stage, a smaller average number of results returned and higher decision satisfaction than the User-Expert product review provision. Table 4 lists the descriptive statistics. All statistical tests were conducted at a 5% level of significance to control for the possible influence of product knowledge on the dependent variables.

Table 4. Means (Standard Deviations) of Dependent Variables		
Dependent variables	Expert-User treatment	User-Expert treatment
Cognitive effort	4.92 (.114)	5.64 (.120)
Product review reading time (pre-screening)	135.34 (27.903)	34.64 (7.355)
Product review reading time (post-screening)	8.54 (2.507)	38.18 (9.053)
Decision satisfaction	5.73 (.085)	6.06 (.081)
Average number of results returned	98.02 (10.540)	168.09 (17.695)

Before proceeding to perform the hypotheses testing we conducted a modeling pretest to verify whether a need existed to have the regression model considering the random-intercept. In other words, we needed to reject the null hypothesis that the between participant-variance is zero (i.e., $\varphi = 0$). To do so, we performed the likelihood-ratio test by comparing 2 models: 1) the model with the random-intercept, and 2) the model without the random-intercept. The likelihood-ratio test suggests that the null hypothesis (i.e., $\varphi = 0$) could be rejected. This suggests the significant importance of considering the participant-specific cluster in the regression modeling approach. Hence, the subsequent analysis would use the linear random-intercept with the covariates regression modeling technique with participant-specific clustering as well as the use of product knowledge as the control variable. Table 5 depicts the analysis results.

Table 5. Results of Linear Random-Intercept with Covariates Regression Modeling						
		Decision Process			Decision Outcome	
		Cognitive effort	Product review reading time (pre-screening)	Product review reading time (post-screening)	Decision satisfaction	Average number of results returned
Level 1 – fixed effect						
Product review provision (0 – user reviews; 1 – expert reviews)	Coefficient	-.736	99.201	-30.493	-.319	-69.929
	Std. dev	.232	28.886	10.634	.157	21.242
	Z	-3.17***	3.43***	-2.87***	-2.03**	-3.29***
Product knowledge	Coefficient	-.093	-9.827	-5.580	.033	.903
	Std. dev	.050	9.501	3.120	.037	6.853
	Z	-1.83	-1.03	-1.79	.89	.13
Intercept	Coefficient	6.027	75.892	61.601	5.919	164.297
	Std. dev	.268	44.799	15.098	.190	32.446
	Z	22.50***	1.69	4.08***	31.13***	5.06***
Level 2 – random effect						
Random-intercept standard deviation coefficient		.684	0	21.673	.443	20.240

Residual standard deviation	.725	177.861	51.525	.536	122.836
Intra-class correlation	.471	0	.150	.405	.026
Overall					
Wald Chi-square (2)	13.05	13.25	10.98	5.02	10.92

Process measures: H1 posits that the presence of an Expert-User product review provision will lead to more product review reading time before the screening stage than the User-Expert product review provision. As predicted, the experiment results indicate that when consumers read the product reviews at the pre-screening stage, they are more inclined towards the expert review in acquiring basic product information, and hence they would spend more time reading the expert reviews at the pre-screening stage ($Z = 3.43$, $p < .01$). Hence, H1 is supported.

Likewise, H2 posits that the presence of an Expert-User product review provision would lead to lower cognitive effort during the online shopping decision process than with the User-Expert product review provision. As predicted, if the product information provision fits the consumer's cognitive informational need, the consumer would feel more comfortable and cognitive effort in the process would be reduced. The expert review at the pre-screening stage is more informative, enriched and well formatted. It will facilitate the consumer in reducing the easily set alternatives, hence leading to lower cognitive effort ($Z = -3.17$, $p < .01$). Hence, H2 is supported.

H3 posits that the presence of the Expert-User product review provision would lead to less product review reading time after the screening stage than with the User-Expert product review provision. As predicted, if consumers acquired sufficient general product information at the pre-screening stage, they will be better informed about the designated products. Hence they would be more inclined towards their own judgment rather than on the other information sources. In this vein, consumers would reduce the product review reading time at the post-screening stage ($Z = -2.87$, $p < .01$). Hence, H3 is supported.

Outcome measures: H4 posits that the presence of the Expert-User product review provision would lead to a smaller average number of results returned during the online shopping decision process than with the User-Expert product review provision. As predicted, in the Expert-User product review provision scenario, consumers read expert reviews before the screening stage, so that they would have the ability to eliminate the unsuitable alternatives and yield a small number of alternatives sets ($Z = -3.29$, $p < .01$). Hence, H4 is supported.

H5 posits that the presence of the Expert-User product review provision would lead to higher decision satisfaction during the online shopping decision process than the User-Expert product review provision. However, the experiment results indicated that consumers will have higher decision satisfaction if they read the expert reviews at the post-screening stage ($Z = -2.03$, $p < .05$). Hence, H5 is not supported.

Table 6. The Results of Hypotheses Testing

Hypothesis	Z-value	Supported
H1: Expert-User product review provision would lead to greater product review reading time at the pre-screening stage.	3.43***	Yes
H2: Expert-User product review provision would lead to lower cognitive effort.	-3.17***	Yes
H3: Expert-User product review provision would lead to less product review reading time at post-screening stage.	-2.87***	Yes
H4: Expert-User product review provision would lead to a smaller average number of results returned.	-3.29***	Yes
H5: Expert-User product review provision would lead to higher decision satisfaction.	-2.03**	No

***: $p < .01$; **: $p < .05$

Discussion

The product review and the consumer purchase decision remains a perpetual issue for scholars. In recent years, with the rapid growth of electronic commerce and the product review provision, this topic is stimulating scholars' interest in investigating the relationship between the product review and the purchase decision performance. In this study, we take a step forward by examining the joint impact of different sources of product reviews and the placement of reviews on the purchase decision performance. Anchoring on Kuhlthau's ISP model, we found general support for the overarching proposition, which is: *The Expert-User product review provision will have a more positive, significant impact on the decision process and outcome than the User-Expert product review provision.*

The experiment results indicate that the Expert-User product review provision would lead to a higher purchase decision performance than the User-Expert product review provision, in terms of both the decision process and decision outcome. Consumers would perceive less cognitive effort when they experience the Expert-User product review provision. In addition, we examined the perceived decision difficulty between the treatment groups during the decision process. The results (see Table 7) indicate that there is an explicit difference between the treatment groups. The Expert-User product review provision will lead to lower perceived purchase decision difficulty during the online shopping experience. It shows that we have successfully manipulated the experiment. Furthermore, this result indicates that the Expert-User product review provision will have a more positive impact on online shopping decision performance.

Table 7. The Decision Difficulty Means		
	Mean (Standard Deviation)	Z value
Expert-User treatment	4.39 (.131)	Z=-3.67***
User-Expert treatment	5.34 (.124)	
***: p<.01		

However, as the results indicate, the Expert-User product review provision will not lead to higher decision satisfaction than the User-Expert product review provision after the screening stage. In order to explain this observation, we adopted the paradigm of reason-based choice, which is a classic theoretical underpinning of decision-making. The central thesis of this paradigm is that a consumer would construct a decision based on the balance of reasons for and against the available product alternatives. Unlike the value-based decision model, the reason-based choice provides a natural way to understand the conflict that characterizes the making of decisions in the real world (Shafir et al. 1993). Specifically, the reason-based choice has several appealing features for analyzing real world decision behavior. First, it is closer to the way people normally think and talk about choice. Second, it provides a natural way to understand the conflict that characterizes the making of decisions. Third, it may incorporate comparative considerations of the people's choice-making in the real world.

In relation to our context, when consumers are presented with a screened list of product alternatives, they would make a choice based on identifying the reasons for procuring a product alternative. To this end, the provision of appropriate product review information could facilitate the gathering of procurement reasons. In terms of the degree of satisfaction associated with the procurement decision, we conceive that the user review in the post-screening stage provides the user experience for a consumer to take into consideration. However, the user reviews are often disjunctive in nature, and they can only express the emotional experience of the former users. Indeed, the sharing of user reviews by customers who have experienced a product or service may prove contradictory to "the social and psychological consequences of the purchase decision" (Brown et al. 2007). When the sharing of such information in the form of reviews is copious, it may generate uncertainty about the product alternatives concerned (Godes et al. 2004). Compared with the user reviews, the expert reviews could deliver a more definitive comment to consumers. The expert review can assist consumers in finding more definite and enriched reasons to justify their choices, and are thereby render them more inclined towards a definite reason for a convenient choice (Shafir et al. 1993). In this vein, consumers will perceive more satisfaction if they have a definite reason for their choice.

Limitations

Despite all efforts, this study suffers several limitations which serve as suggestions for future research. First of all, although we have sufficient observation data in our study, we look forward to involving more participants in future

research. In order to yield an effect size f of 0.25, and power of 0.95 for six measurements, the total sample size required is 28. In this study, we have a sufficiently large total sample and the results have acceptable levels of statistical power. However, it is more feasible to have more participants in future research.

Furthermore, in this study, we only considered the digital products and the product reviews. The reason of choosing the digital products for the experiment is that in the ordinary world, there are numerous Business-to-Consumer websites sell digital products on the Internet (e.g. newegg.com, bestbuy.com). Furthermore, in order to ensure subjects have interest to purchase the selected digital product categories, we asked students to rank the willingness to purchase over 20 product categories in the pre-test. The selected product categories in the experiment were ranked the top 3 in the pre-test. However, in order to generalize our findings, we should investigate other product categories (e.g. clothing and cosmetics) as well in future research.

Implications

In spite of the limitations outlined in the previous section, this study offers several contributions which may help researchers and practitioners to refine the study. Future research is necessary for better understanding of the full range of implications that the research surfaces.

First, this study contributes to theoretical development on the consumer decision-making process. This study adopts the information search process model to investigate online shopping decision performance comprehensively. While the extant adoption of information search process model reveals that it has been primarily applied in two areas, it is used to explain the information retrieving behavior of humans. It is also used to predict consumers' information search behavior in the information resource discovery system. This model can describe and predict the information requirements and cognitive information search behavior in the problem-solving and decision-making contexts. However, it is seldom adopted in Information Systems (IS) studies to evaluate the effectiveness of information acquisition through technology (Jiang et al. 2007).

Second, we further expand on our study's findings by considering the paradigm of reason-based choice. Specifically, in the last stage of the information search process, users are seeking the definite and enriched reasons (information) for justification (Shafir et al. 1993). Our study's findings imply that in the decision-making context, users' first search for information to diminish their knowledge uncertainty, before looking for relevant information and evaluating the alternatives. Finally, the users seek pertinent information for justification; and hence this kind of information should be definite and enriched.

Third, this study involves the extensive process of consumer purchase decision behavior on the Internet. Prior studies argue that online decision aid systems have been successful in providing decision information in the latter stages of a search, but seldom have such studies investigated the impact of information that is provided on the threshold of the online shopping decision making process. Anchoring on the information search process model, this study examines the impact of different information provisions in different stages of decision-making. The findings of this study may have some implications for future research.

The implications of this study are also of value to practitioners. Most of the B2C websites provide both the expert and user reviews, but they seldom consider the effects of different sources of review and their impact on the consumer's cognition and decision toward the product. The consumer psychologists have observed that the source and sequence of product information provision do have significant effects on a consumer's perception and decision-making behavior (Kleinmuntz et al. 1993; Chakravarti et al. 2006). Hence, for the B2C website designer, it is important to understand the relationship between a consumer's perception of different kinds of product reviews and their online purchasing decision behavior. Correspondingly, the website designer can complement and update the website interface design and the website content design in order to enhance the consumer's "stickiness" to the B2C website.

Essentially, our study investigates the underlying mechanism of this phenomena and explains "why" the expert-user product review provision could enhance a consumer's purchasing decision performance, rather than "how" it is done. By observing the results of our study, website designers could have clearer goals and website design guidelines. Although no website can prevent users from reading either type of review before or after the screening stage, we suggest that website designers can design an IT artifact providing such guidance. The online shopping decision system should be designed to coordinate with the consumer's information search process. Specifically, consumers can compare the expert and user comments after screening the alternatives, so that they will feel more confident about their choices and gain an understanding of the usage experience and hence become aware of the genuine specifications of the product.

Conclusion

Electronic commerce has the potential to grow exponentially. After the world-wide financial recession of 2009, it is promising to anticipate that electronic commerce would be a new economic growth point. It is projected that sales from electronic-commerce in China alone might reach USD2.5 billion by the end of 2010. Hence it is important to understand how the online product review provision is best utilized during the decision-making process in the online context. The product review provision, as one of many online decision aids, makes product information accessible throughout the consumer's purchase decision process. In addition, it will greatly influence a consumer's purchase decision. This study has made a modest step towards developing a theoretically sound understanding of the online product review provision and its consequences. The implications will prove beneficial to both scholars and practitioners.

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